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Certificate of Analyses

B.C.S. No. 342 (S.S. No. 72*) FERRITIC STAINLESS STEEL

Prepared under rigorous laboratory conditions and, AFTER STANDARDIZATION BY ANALYSTS
IN GREAT BRITAIN, issued by the Bureau of Analysed Samples Ltd.

The standard bar was specially prepared by Edgar Allen and Co. Ltd., Sheffield.

ANALYSES

| Analyst No. | C % | Si % | S % | P % | Mn % | Cr % | Ni % | Mo % | Cu % |
|-------------|------|------|-------|-------|------|-------|------|------|-------------|
| 1 | .. | .. | 0.025 | 0.030 | .. | .. | .. | 0.69 | <i>0.08</i> |
| 2 | 0.19 | 0.92 | 0.025 | 0.030 | 0.92 | 16.06 | 2.16 | 0.69 | .. |
| 3 | 0.18 | .. | .. | .. | 0.91 | 16.19 | 2.19 | .. | .. |
| 4 | 0.18 | 0.93 | 0.027 | 0.032 | 0.92 | 16.15 | 2.15 | 0.71 | .. |
| 5 | .. | 0.91 | .. | .. | 0.92 | .. | 2.15 | .. | .. |
| 6 | .. | .. | .. | .. | .. | 16.15 | 2.15 | .. | .. |
| 7 | 0.19 | 0.91 | 0.025 | 0.028 | 0.90 | 16.09 | 2.15 | 0.69 | .. |
| 8 | .. | 0.92 | .. | .. | 0.91 | .. | .. | .. | .. |
| 9 | .. | 0.93 | .. | .. | .. | .. | 2.17 | 0.68 | .. |
| 10 | .. | 0.93 | .. | 0.030 | 0.90 | .. | .. | 0.68 | .. |
| 11 | 0.19 | .. | .. | 0.030 | 0.92 | 16.18 | .. | .. | .. |
| 12 | .. | 0.93 | 0.027 | .. | .. | .. | .. | 0.68 | .. |
| 13 | 0.18 | .. | 0.028 | 0.030 | .. | 16.13 | .. | 0.70 | .. |
| 14 | 0.18 | .. | 0.028 | 0.031 | .. | 16.14 | .. | .. | .. |
| 15 | .. | .. | 0.025 | .. | .. | 16.04 | .. | .. | .. |
| Average | 0.18 | 0.92 | 0.026 | 0.030 | 0.91 | 16.15 | 2.16 | 0.69 | .. |

The above figures are those which each Analyst has decided upon after careful verification.

Figures in bold type standardized, figures in small italic type only approximate

*Due to slight segregation of certain elements an area $\frac{5}{16}$ " in diameter in the centre of the spectroscopic standards should be avoided for emission spectroscopy.

[P.T.O.]

CO-OPERATING ANALYSTS AND FIRMS

REFEREE ANALYSTS—INDEPENDENT

1. BRITISH IRON & STEEL RESEARCH ASSOCIATION, (per P. H. Scholes, *A.Met.*, *L.R.I.C.*, *L.I.M.*, Sheffield).
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GOVERNMENT DEPARTMENT

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15. TAYLOR, L. N., Samuel Osborn & Co. Ltd., Sheffield.

B.C.S. No. 342 (S.S. No. 72) FERRITIC STAINLESS STEEL

NOTES ON METHODS USED

CARBON

Analysts Nos. 2 and 7 determined carbon by the Standard gravimetric method B.S. 1121: Part 11: 1948. The method was slightly modified in each case; No. 2 used pure tin as flux, No. 7 used a 5g sample. Nos. 3 and 11 determined carbon conductimetrically. No. 3 used a microchemical method (Nall & Scholey, *Metallurgia*, 1961 64, 97). No. 11 used a balanced two-cell circuit method. Nos. 4, 13 and 14 used the low-pressure method (Cook & Speight, *Analyst*, 1956, 81, 144).

SILICON

All Analysts except No. 5 determined silicon gravimetrically by the Standard method B.S. 1121: Part 10: 1967 in which the silica is dehydrated by double evaporation with perchloric acid. No. 5 used a similar method but dehydrated with a mixture of sulphuric and perchloric acids.

SULPHUR

Analysts Nos. 1, 4, 7, 14 and 15 determined sulphur gravimetrically. Nos. 1, 7, 14 and 15 used the Standard method B.S. 1121: Part 1: 1966. No. 4 used a method involving chromatographic separation of the sulphur, as sulphuric acid, on an alumina column (Nydahl, *Anal. Chem.*, 1954, 26, 580). Nos. 2, 12 and 13 determined sulphur by combustion. No. 2 used a modified IRSID stoichiometric method (Green, B.C.I.R.A. *Journ.* 1963, 11, 76) with tin as flux. Nos. 12 and 13 used conventional methods; No. 12 absorbed the sulphur gases in dilute hydrochloric acid and titrated with iodide/iodate solution, No. 13 absorbed in hydrogen peroxide solution and titrated with borate solution.

Analysts Nos. 1 and 14 also determined sulphur by combustion. No. 1 used an electrical conductivity method after IRSID type combustion in oxygen and found 0.023%. No. 14 used a conventional combustion method and found 0.028%.

PHOSPHORUS

Analysts Nos. 1 and 14 determined phosphorus by the Standard gravimetric method B.S. 1121: Part 9: 1948. The other Analysts determined phosphorus colorimetrically using the Standard method B.S. 1121: Part 45: 1966 which depends on formation of phosphovanadomolybdic acid and extraction with *isobutyl methyl ketone*.

Analyst No. 1 also used two alternative methods (a) a molybdenum blue colorimetric method in conjunction with an automatic analyser (b) a phosphovanadomolybdate colorimetric method; the results obtained were 0.031% and 0.027% respectively. No. 14 also used a phosphovanadomolybdate colorimetric method and found 0.030%.

MANGANESE

All Analysts except No. 7 determined manganese colorimetrically as permanganic acid. Nos. 2, 3, 4, 10 and 11 used the Standard method B.S. 1121: Part 23: 1951 which depends on oxidation with periodate. No. 5 used a similar method. No. 8 oxidized with persulphate/silver nitrate. No. 7 used the Standard volumetric method B.S. 1121: Part 16: 1951.

Analyst No. 5 also used a colorimetric method depending upon oxidation with persulphate/silver nitrate and found 0.92%.

CHROMIUM

All Analysts determined chromium volumetrically. No. 2 used the Analoid method No. 37 in which the hexavalent chromium is titrated with ammonium ferrous sulphate. Nos. 4, 7, 13, 14 and 15 used the Standard method B.S. 1121: Part 13: 1954 in which the chromium is titrated with ammonium ferrous sulphate/potassium permanganate. Nos. 6 and 11 used a similar method but titrated with ammonium ferrous sulphate/dichromate. No. 13 used both the Standard method and the modification employing titration with ammonium ferrous sulphate/dichromate.

Analyst No. 7 also used the ammonium ferrous sulphate/dichromate titration and found 16.09%.

NICKEL

Analysts Nos. 2, 4, 6 and 9 determined nickel volumetrically after precipitation with dimethylglyoxime. No. 2 used the Analoid method No. 62 in which the filtered precipitate is dissolved in dilute sulphuric acid, boiled with excess ferric alum, and the ferrous salt thus formed is titrated with standard dichromate solution. Nos. 4 and 9 titrated cyanometrically according to the Standard method B.S. 1121: Part 37: 1961. No. 6 titrated with EDTA. Nos. 3, 5 and 7 determined nickel colorimetrically with dimethylglyoxime. Nos. 3 and 7 used the Standard absorptiometric method B.S. 1121: Part 6: 1948.

Analyst No. 5 also used a cyanometric method and found 2.16%.

MOLYBDENUM

Analysts Nos. 1, 2, 7, 9, 10 and 12 determined molybdenum colorimetrically as the oxythiocyanate complex. Nos. 1, 7 and 10 used a method involving extraction with butyl acetate. No. 2 used the Analoid method No. 42. Nos. 9 and 12 used the Standard method B.S. 1121: Part 34: 1955. No. 4 determined molybdenum colorimetrically with toluene 3: 4-dithiol (Wells and Pemberton, Analyst 1947, 72, 185).

COPPER

Colorimetric method using *bis*-cyclohexanone oxalyldihydrazone (Analoid method No. 65).

NEWHAM HALL,
MIDDLESBROUGH,
ENGLAND

For BUREAU OF ANALYSED SAMPLES LTD.

P. D. RIDSDALE,
Managing Director

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